Bangladdesh J. Agri. 2012, 37(1):37-42

EFFECT OF FOUR SELECTED CHEMICALS ON THE INCIDENCE OF *MUNGBEAN YELLOW MOSAIC VIRUS* AND SEED YIELD OF MUNGBEAN

M.M. Kamal, A.M. Akhanda[1] and A.H.M.M. Haque

Pulse Research Centre
Bangladesh Agricultural Research Institute
Gazipur-1701, Bangladesh

Abstract

A field experiment was conducted to evaluate the efficacy of Furadan 5G (carbofuran), Dursban 20EC (chloropyrifos), Ripcord 10EC (cypermethrin) and Admire 200SL (imidachloprid) for the management of mungbean yellow mosaic virus at Bangladesh Agricultural Research Institute, Joydebpur, Gazipur during March to June 2008. At 50 DAS the lowest disease incidence and severity was recorded for Admire received plants and the highest was found in control. Incidence of whitefly and *Mungbean yellow mosaic virus* (MYMV) was positively and seed yield was negatively correlated with white fly population. All the chemicals decreased MYMV incidence but Admire (imidachloprid) performed the best results which reduced disease incidence by 30.86% and the seed yield increase by 20.06% over control.

Introduction

Mungbean is an important pulse crop having global economic importance as dietary ingredient of the staple food. The average yield of mungbean is 617.50 kg/ ha in Bangladesh which is quite low as compared to potential yield of this crop other pulse growing countries (Anon. 2006). Earlier mungbean as a food legume was considered as the cheap source of protein but now-a-days all pulses has gone out of the reach of general people due to its drastic reduction in production vis-vis price escalation. Generally grain legumes are limited by the low sulfur containing amino acids like cysteine and methionine. Both of these amino acids are comparatively more in mungbean (Engel, 1978). So far twenty diseases of mungbean have been recorded, of which viral diseases are the most damaging to the crop (Rashid and Bakr, 2007). Yellow mosaic is the most destructive yield damaging viral disease of mungbean in Bangladesh (Jalaluddin and Shaikh, 1981). The causal organism is *Mungbean yellow mosaic virus* (MYMV) which is transmitted nonpersistently by whitefly (*Bemisia tabaci*) and grafting but not by sap inoculation (Niriani, 1960). According to Rashid and Bakr (2007) MYMV causes up to 85% yield loss when infection starts from the 4th week of sowing. The control of insect vector is an important tactic for managing yellow mosaic disease of mungbean. Some chemicals were found to be effective in reducing the incidence of yellow mosaic disease (Borah, 1996). Though injudicious application of these chemicals pollute the environment and cause health hazard but other alternate approaches like plants extracts and cultural practices were not found effective against the vector. Considering the facts stated above, the present investigation was undertaken to determine the efficacy of four selected chemicals in reducing the incidence and severity of *Mungbean yellow mosaic virus* and to determine the relationship among the virus, vector and seed yield of mungbean.

---

[1] Bangabandhu Sheik Mujibur Rahman Agricultural University, Salna, Gazipur-1706, Bangladesh

Materials and Methods

The experiment was conducted at the experimental farm of the pulses pathology sub-division of Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur, Bangladesh during the period March to June 2008. Seeds of mungbean variety BARI Mung-4 were used and the experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. The size of the plot was 4.0 m x 2.4 m and crop was sown in six rows per plot where row to row distance 40 cm and plant to plant distance10cm. The seeds were sown in the field on 15th March, 2008 @ 40 kg/ha and seeds were placed continuously in lines at the depth of 3-4 cm. Cowdung, Urea, TSP and MP was applied as recommended by Pulses Research Centre. Five different treatments of the experiment were; T_1 = Application of Furadan 5G (carbofuran) @ 1.5kg a.i/ha at sowing, T_2 = Application of Dursban 20 EC (chloropyrifos) @ 2ml/litre at 15, 25, 35 and 45 days after sowing, T_3 = Application of Ripcord 10 EC (cypermethrin) @ 1ml/litre at 15, 25, 35 and 45 day after sowing, T_4 = Application of Admire 200SL (imidacloprid) @ 1ml/liter of water at 15, 25, 35 and 45 day after sowing and T_5 = Untreated (control). All seeds were treated with Vitavax-200 @ 2gm/kg before sowing. Ten plants per plot were tagged randomly from six inner rows leaving 15 cm from the corner. These plants were used for recording data on whitefly. Whitefly was counted *in sito* from fully unfolded top leaves of the plant. Data was recorded at an interval of 10 days commencing from first incidence and counted up to maturity of crop. The incidence of mosaic was recorded three times at 10 days interval i.e., 30 days after sowing (DAS). The mosaic infected plants were identified as described by Ahmed (1985). Assessment of different chemicals against MYMV was carried out on the basis of % disease infection and scored them using recommended 1-9 arbitrary scale (Singh *et al.*1995) at 30, 40 and 50 DAS.

Disease Severity	Percent Infection	Infection Category	Reaction Group
1	1-10	Resistant	RR
3	11 -20	Moderately resistant	MR
5	21-30	Moderately susceptible	MS
7	30-50	Susceptible	S
9	More than 50%	Highly susceptible	HS

The data obtained for different characters were analyzed statistically by using MSTATC program and the means were compared according to LSD (Least Significant Difference) at 5% level of probability (Gomez and Gomez 1984).

Results and Discussion

Whitefly incidence

Four selected chemicals were used as treatments for managing *Mungbean yellow mosaic virus* which showed statistically significant differences among the treatments in whitefly population. The minimum (1.72) number of whitefly per 5 leaves was recorded for treatment T_4 which was closely followed by treatment T_1 (2.65) and T_3 (2.78). The maximum (5.17) number of whitefly per 5 leaves was recorded for treatment T_5 which was followed by T_2 (4.00). The highest population reduction (66.63%) over control was recorded in T_4 treatment and the lowest (22.63%) in T_2 (Table 1). The present findings are relevant with Cahill *et al.* (1995) who reported that Imidachloprid (a systemic chloronicotinyl insecticide) gained major importance

for control of *Bemisia tabaci* in both field and protected crops, in view of extensive resistance to organophosphorus, pyrethroid and cyclodiene insecticides.

Table 1. Effect of selected chemicals on the incidence of white fly population in MYMV infected mungbean plants

Treatment	No. of whitefly per five leaves	Population reduction over control (%)
T_1 = Furadan (Carbofuran)	2.65 bc	48.74
T_2 = Dursban (Chloropyrifos)	4.00 ab	22.63
T_3 = Ripcord (Cypermethirin)	2.78 bc	46.09
T_4 = Admire (Imodachloprid)	1.72 c	66.63
T_5 = Control (Untreated)	5.17 a	--
LSD (0.05)	1.46	--
CV (%)	22.33	--

Disease incidence

Remarkable variation was recorded in disease incidence due to application of different chemicals at 30 DAS. The lowest (12.12%) disease incidence was recorded in treatment T_4 (Fig. 1) which was statistically identical (15.48%) with treatment T_1. The maximum (21.57%) disease incidence was recorded in treatment T_5 which was followed by T_2 (20.88%). At 40 DAS a significant difference was recorded in disease incidence for different treatments. The lowest (23.26%) disease incidence was recorded in treatment T_4, while the highest (48.74%) in T_5. At 50 DAS different treatments showed a significant variation in respect of incidence of *Mungbean yellow mosaic*. The lowest (34.40%) disease incidence was recorded in T_4 treatment. The highest (65.26%) disease incidence was recorded in treatment T_5. The results are of in agreement with the finding of Singh *et al.* (1982). They observed that application of chemicals resulted more vigorous vegetative growth allowing the plants to escape viral infections and effect of infection. The findings of present study are also relevant with the results of Saran and Giri (1990). They suggested that Admire (imidacloprid) might have great impact in reducing disease incidence and severity of yellow mosaic disease and producing disease free plants.

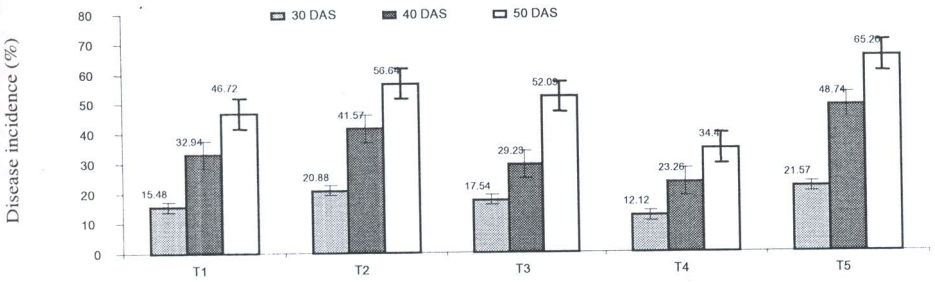

Fig. 1. Effect of four different chemicals on the incidence of MYMV of mungbean.

Disease severity

Different chemicals were used for managing *Mungbean yellow mosaic virus* in this trial showed statistically significant variation for disease severity calculated at 30, 40 and 50 DAS (Fig. 2). At 30 DAS, the disease severity was recorded lowest (1) from treatment T_1 followed by T_3 and T_4 while the highest disease severity (3) for treatment T_2 and T_5. At 40 DAS, the lowest disease severity (3) was recorded from treatment T_4 while the highest severity (7) in T_5 and the rest three treatments (T_1, T_2 and T_3) showed the same disease severity (5). At 50 DAS, the lowest disease severity (5) was recorded for treatment T_4. On the other hand the highest disease severity was recorded for treatment T_5 (9) and the treatment T_1, T_2 and T_3 showed the similar disease severity (7).

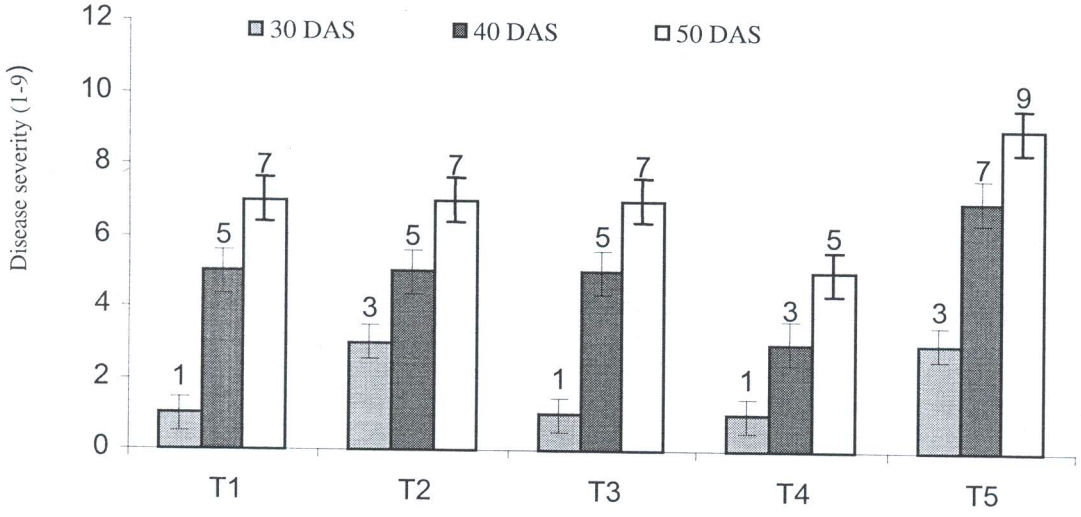

Fig. 2. Effect of four different chemicals on the severity of MYMV of mungbean

Seed yield

The effect of four different chemicals on the seed yield of mungbean against the infection *Mungbean yellow mosaic virus*es were recorded significant difference and presented in the Table 2. The highest seed yield (999.06 kg/ha) was recorded in treatment T_4, while the lowest yield (730.31 kg/ha) in T_5 (Table 2). The maximum yield increased (22.90%) over control was recorded for T_4 treatment and the minimum (3.34%) in treatment T_2. Jain *et al.* (1995) also reported that Admire (imidachloprid) have positive impact in reducing disease incidence and severity of yellow mosaic disease which performed better in respect of seed yield.

Table 2. Effect of selected chemicals on seed yield of mungbean against MYMV infection

Treatment	Seed yield (gm/plot)	Seed yield (kg/ha)	Seed yield increased over control (%)
T_1= Furadan (Carbofuran)	877.00 b	913.54 b	20.06
T_2= Dursban (Chloropyrifos)	725.30 d	755.52 d	3.34
T_3= Ripcord (Cypermethirin)	836.60 c	871.46 c	16.20
T_4= Admire (Imidachloprid)	959.10 a	999.06 a	22.90
T_5= Control (Untreated)	701.10 e	730.31 e	--
LSD (0.05)	15.02	--	--
CV (%)	0.97	--	--

Relationship between the number of white fly and MYMV incidence

A strong positive correlation exists between the number of white fly and MYMV incidence, which indicated that higher number of white fly maximize the MYMV incidence. The results of the study are in conformity with the study of Aftab *et al.* (1992) and Nath (1994) who observed a positive correlation between incidence of MYMV and population size of *B. tabaci*. A linear regression line was fitted between the number of white fly per 5 leaves and MYMV incidence (Fig.3) at 50 days after sowing. The correlation of coefficient (x) showed 8.2376 and the contribution of regression (R^2 =0.9176) was 91%.

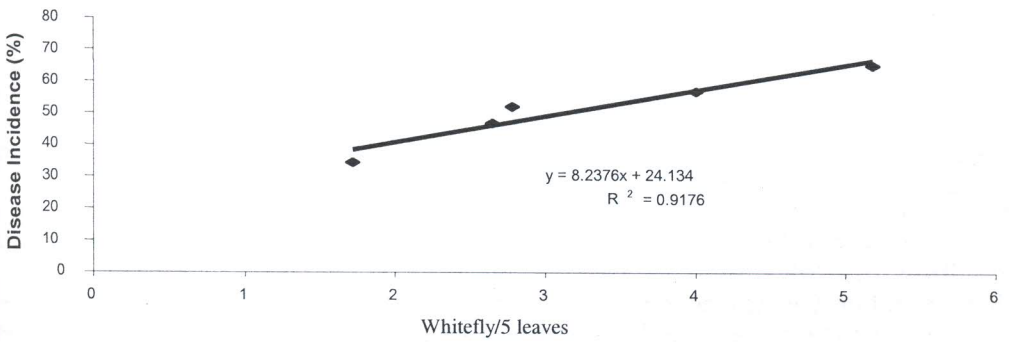

Fig. 3. Relationship between the number of white fly and MYMV incidence obtained from four different chemical treatments.

Relationship between the incidence of MYMV and seed yield

There was a negative correlation observed between the incidence of MYMV and total seed yield, which indicated that higher incidence of MYMV conversely minimize the total seed yield. The results of the findings are similar with the findings of Bisht *et al.* (1988) and Gill *et al.* (1999). They observed that MYMV infection at early stage of crop growth maximize disease incidence which caused much higher reduction of seed yield. A linear regression line was fitted between the incidence of MYMV and seed yield recorded at 50 days after sowing (Fig. 4). The correlation of coefficient (x) was negative (-9.3603) and the contribution of regression (R^2 =0.9312) was 93%.

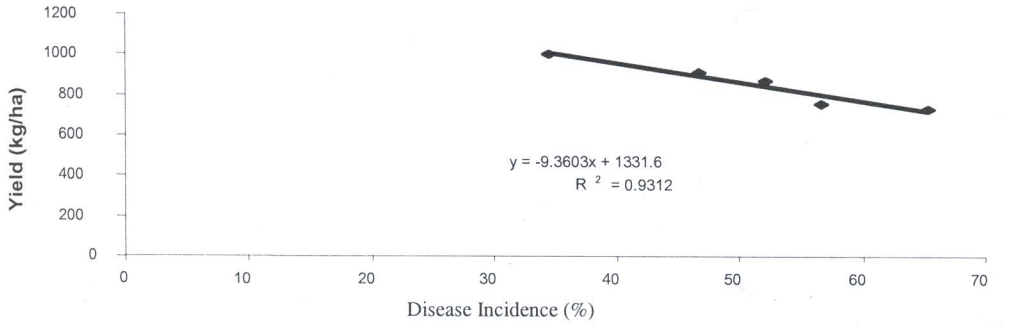

Fig. 4. Relationship between the incidence of MYMV and seed yield of mungbean obtained from four different chemical treatments

Conclusion

In the present study application of Admire (imidachloprid) was found to be the best treatment in reducing the white fly infestation as well as minimizes the incidence and severity of *Mungbean yellow mosaic virus* as well as maximum seed yield. Use of indirect method of viral disease management through control of vector is a possible way. A positive correlation was found between the infestation of white fly and MYMV incidence. A negative correlation also found between the incidence of MYMV and total seed yield of mungbean.

References

Aftab, M., S. Asad., K.M. Khokong, M.A. Ayub and K. Butt. 1992. Effect of *Mungbean yellow mosaic virus* on yield and growth components of *Vigna radiata*. *Pakistan Journal of Phytopathology*. **5** (1-2): 58-61.

Ahmad, H.U. 1985. Disease problem of pulses and oilseed crops in Bangladesh. Paper presented at the first biennial conference of the Bangladesh Phytopathological Society. 13-14 April, BARI, Joydebpur, Gazipur, Bangladesh.

Anonymous (Bangladesh Bureau of statistics). 2006. Statistical Year Book of Bangladesh. Statistics Division, Ministry of planning, Govt. of the peoples Republic of Bangladesh.56 p.

Bisht. I.S., S. Sharmsher. B.S. Dabas and S. Singh. 1988. Effect of *Mungbean yellow mosaic virus* on growth components and yield of four promising cultivars of mungbean. *Indian J. of Mycol and Pl. Pathol.* **18** (2): 204-205.

Borah, R.K. 1996. Effect of systemic pyrethroids and organophosphates insecticides on the incidence of whitefly, *Bemisia tabaci* (Genn.) and yellow mosaic virus in green gram *Vigna radiata* (L.) Wilzek. *Indian J. of virology*. **11**(1): 75-76.

Cahill, M., F.J. Byrne., K. Gorman., I. Denhoim and A. L. Devonshire. 1995. Pyrithroid and Organophosphate resistance in tobacco Whitefly, *Bemisia tabaci* (Homoptera Aleyrodidae). Bulletin of Entomological Research. **85**: 181-187.

Engel, W.R. 1978. The importance of legumes as a protein source in Asia diets. In. Cowell, Red. Proc. First Int. mungbean symp. AVRDC, Shanhua, Taiwan. 35-39 p.

Gill, C. K., S. Labh and L. Singh. 1999. Effect of *Mungbean yellow mosaic virus* on yield components in mungbean cultivar. *Insect Environment*. **5** (3): 112-113.

Gomez, K.A. and A.A. Gomez. 1984. Statistical procedure for Agricultural Research (2nd edn.) Int. Rice Res. Inst. A. Willey *Int. Sci. Pub.* **28**-192 p.

Jain, A.K., H.S. Yadava and J.C. Gupta. 1995. Grain yield and its components as affected by yellow mosain virus in blackgram, **16** (3): 364-366.

Jalaluddin, M. and M.A.Q Shaikh. 1981. Evaluation of mungbean (*Vigna radiata* L. Wilczek). Germplasm for resistance to *yellow mosaic virus*. *SABRAO Journal* . **13** (1): 61-68.

Nariani, T.K. 1960. Yellow mosaic of Mungbean (*Phaseolus aureus*). *Indian Phytopath*. **13**: 24-29.

Nath, P.D. 1994. Effect of time on the incidence of *yellow mosaic virus* disease and whitefly population on green gram. *Annals of Agricultural Research*. **15** (2): 174-177.

Rashid, M.H. and M.A. Bakr. 2007. Assessment of yield loss due to *Mungbean yellow mosaic virus* in kharif mung. Pulse Production. BARI, Joydebpur, Gazipur.13 p.

Saran, G. and G. Giri. 1990. Influence on nitrogen phosphate and sulphur on under semi arid and rainfed condition of North-west. *Indian J. Agron*. **35** (1-2): 131-136.

Singh, S.K., B.R. Gupta and H.S. Chib. 1995. Relation of plant age with *yellow mosaic virus* infection on mungbean yield. Integrated disease management and plant health. Editors: V.K. Gupta and R.C. Sharma. Scientific Publishers, Jodhpur. 91-92p.

Singh, B.R.M., M.D. Yadav and S.M. Dianger. 1982. Yield loss in mungbean due to *Mungbean yellow mosaic virus*. *Science and Culture*. **48** (12): 435-436.